THE NATIONAL INTELLIGENT TRANSPORTATION SYSTEMS PROGRAM:

Where We've Been & Where We're Going

U.S. Department of Transportation

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The National ITS Program: Where We've Been and Where We're Going

"It is the policy of the United States to deveIop a National Intermodal Transportation System that is economically sound, provides the foundation for the Nation to compete in the global economy, and will move people and goods in an energy efficient manner. The National Intermodal Transportation System shall consist of all forms of transportation in a unified, interconnected manner, including the transportation systems of the future..."

Intermodal Surface Transportation Efficiency Act, Section 2

By passing the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, Congress ushered in a new era for transportation, calling for more efficient and safe use of existing highway and transit infrastructure and emphasizing intermodalism-seamless integration of multiple transportation modes. In this spirit, Title VI of ISTEA established the Intelligent Vehicle-Highway Systems program (later renamed the Intelligent Transportation Systems program), prescribing the "widespread implementation of intelligent [transportation] systems to enhance the capacity, efficiency, and safety of the Federal-aid highway system and to serve as an alternative to additional physical capacity of the Federal-aid highway system."

During the past five years, the national ITS program, administered by the U.S. Department of Transportation (DOT), has advanced the state of the technology, demonstrated substantial public benefits, fostered new models of institutional cooperation, and begun to change how Americans travel. The program has laid the foundation for an information and communications infrastructure that will enable the vision set forth in ISTEA: management of the multiple transportation systems as one system for greater customer service, efficiency, safety, and quality of life.

What Is Our Mission?

Surface transportation systems-the networks of highways, local streets, bus routes, and rail lines-are the ties that bind communities and facilitate commerce, connecting residents to work, homes, schools, services, and each other. During the past 20 years, however, transportation systems have struggled to keep pace with Americans' growing and changing travel needs. The General Accounting Office has projected that congestion in metropolitan areas could worsen by 300 to 400 percent over the next 15 years unless significant changes are made. Traffic accidents claim more than 41,000 lives each year. And many of the administrative systems supporting commercial freight and mass transit services are antiquated and cumbersome.

Intelligent transportation systems offer promising solutions that respond to these pressing challenges. These systems are diverse and versatile, combining telecommunications, computer, sensing, and electronics technologies to provide real-time information to both traffic managers and travelers on traffic, weather, navigation and vehicle diagnostics-in much the same way the air traffic control system does for air traffic-to achieve greater system efficiency, safety, and convenience. In the future, ITS will provide vehicles with crash warning and collision avoidance capabilities that will dramatically enhance our surface transportation system's safety.

Since 1991, the national ITS program has pursued research, technology development, and field testing, and has promoted deployment of first-generation ITS applications. In this work, it has become clear that the primary barrier to using this technology to achieve the ISTEA vision is not technical. Rather it is institutional. Therefore, the program has engaged in a host of institutional research efforts to encourage partnerships, resolve jurisdictional conflicts, protect personal and organiza-

Guiding Principles of the ITS Program

The multifaceted ITS program compelled DOT to reexamine its traditional way of doing business. In May 1994, the Department established the Intelligent Transportation Systems Joint Program Office (JPO) to manage the program, calling for unprecedented interagency cooperation involving most of DOT's modal administrations the Federal Highway Administration (FHWA), the National Highway Traffic Safety Administration (NHTSA), the Federal Transit Administration (FTA), the Federal Railroad Administration (FRA), and the Research and Special Programs Administration (RSPA) . The ITS program is guided by four key principles:

> Support research and development of ITS technologies to solve problems of surface transportation congestion, safety, efficiency, mobility, and to improve quality of life;

> Ensure that newly developed ITS technologies and services are safe and cost-effective;

> Promote and support the development of an interoperable and integrated system that reduces risks and costs to users as well as to the public and private sector providers of ITS products and services; and

> Identify and emphasize private sector involvement in all aspects of the program.

tional privacy, and identify antitrust, procurement, insurance, and liability issues. The program also examines human behavior and response related to the safety and usability of ITS products and services.

The national ITS program addresses six broad categories of intelligent transportation systems:

> **Enabling Research** focuses particularly on the comprehensive system architecture and associated standards. It lays the foundation for national compatibility among all ITS components. This category of research also aims to improve the capabilities of technologies-such as communications and location-referencing systems-that enable ITS services to function effectively.

> **Advanced Metropolitan Travel Management Systems** include a great range of ITS services that address traffic management, traveler information, and transit management. Services include advanced traffic management systems (ATMS), advanced traveler information systems (ATIS), and advanced public transportation systems (APTS) .

> **Advanced Rural Transportation Systems (ARTS)** apply many of the ITS services in other categories to address the unique safety and mobility problems of diverse rural communities.

> **Commercial Vehicle Operations (CVO)** can be enhanced through advanced technologies and information networks to increase productivity and efficiency for both fleet operators and State motor carrier regulators. The Federal ITS/CVO program focuses particularly on ITS applications to safety, inspection, and other regulatory processes associated with commercial vehicles.

> **Advanced Collision Avoidance and Vehicle Safety Systems** aim to improve driver and pedestrian safety through human-centered vehicles equipped with technologies that can warn of and/or assist the driver to avoid impending crashes, or can automatically signal for help immediately upon or after a collision.

> **Automated Highway Systems** (AHS) will take the potential of crash avoidance-equipped vehicles to a new level. Here DOT's investigation is centered on the potential benefits and feasibility of a smart vehicle that can communicate with a smart infrastructure. Because the AHS will share many subsystems with collision avoidance systems-such as vehicle-based sensors, computational elements, and the driver interface-the two research programs are closely coordinated.

What Have We Spent?

ISTEA authorized a net total of $645 million for the program's funding from fiscal year 1992 to 1997. At the end of fiscal year 1996, $531.8 million of these ISTEA funds had been authorized for expenditure. This amount was supplemented by $459.3 million in funds from the General Operating Expense budget (including $20 million in fiscal year 1991), for total funding of $991.1 million through fiscal year 1996. At the end of 1996, all but approximately $12 million had been oblig-

ated. Roughly 40 percent of total program funding has been congressionally directed.

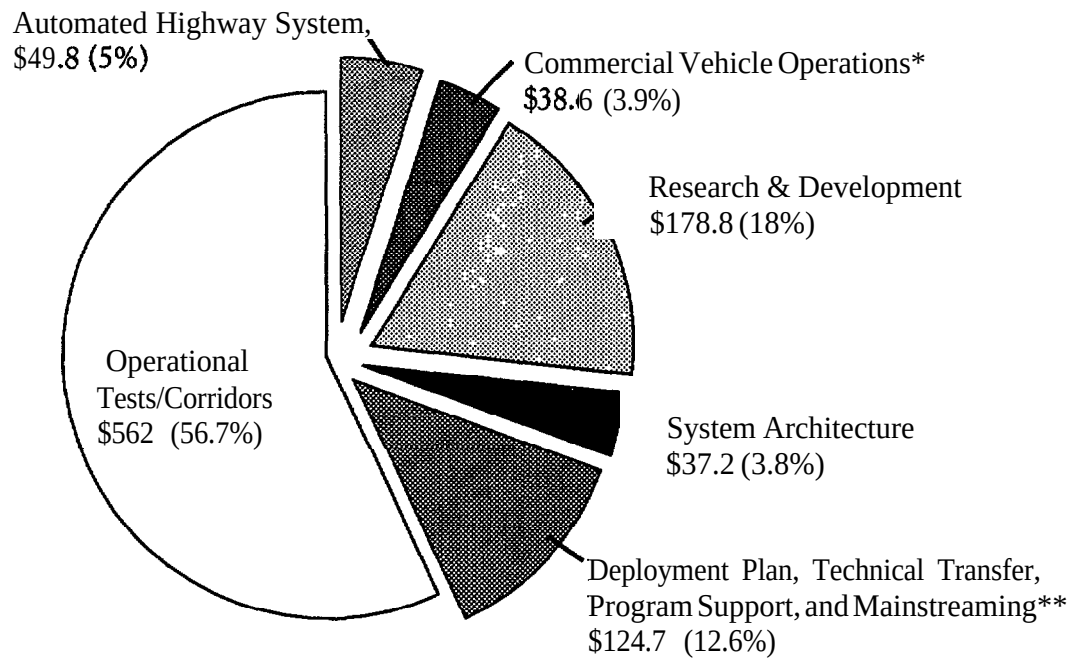
The Department has worked diligently to build partnerships with State and local governments, academia, and the private sector in its three major activities of basic and applied research, field testing, and deployment support.

Basic and Applied Research

The ITS program has sought to adapt existing and emerging information and control technologies to meet basic, everyday transportation needs. Since 1991, about 30 percent of the ITS program funding has supported research and development efforts to improve the state of the art for enabling technologies, advanced metropolitan uavel management systerns, rural ITS applications, commercial vehicle operations, collision avoidance systems, and automated highway systems. Funding has specifically supported development of the National ITS Architecture and essential standards. In addition, the Department has developed and enhanced analysis tools and methods, such as simulation models, to allow transportation professionals to more accurately monitor and control traffic, and evaluate the impacts of ITS services.

"Where has the money gone?"

Fiscal Years 1991-1996
Total ITS Funding – $991.1 Million

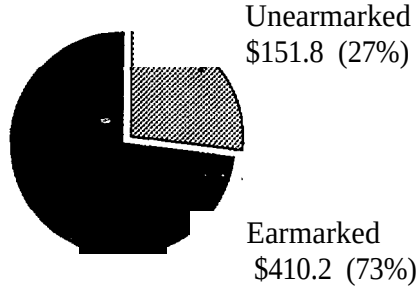


*CVO funds are also included in Research & Development, Operational Tests and Deployment Planning

**$26.2 Deployment Planning, $22.3 Technology Transfer, $60.9 Program Support, and $15.3 for Mainstreaming

Note: Of the $991.1 million made available to the FHWA for the ITS program, $410.2 million (41,4%) has been Congressionally earmarked, leaving $580.9 million (58.6%) to be expended at the discretion of the DOT. Also note that in addition to funding provided for FHWA, NHTSA and FTA received $3 1.5 and $13.2 million, respectively.

Operational Tests/Corridors
Total: $562



Operational Tests/Priority Corridors

About 57 percent of obligated funds has supported field testing and demonstration projects, as part of either operational tests or the ITS Priority Corridors program; 73 percent of this amount was congressionally

directed. These efforts provide a crucial bridge between the laboratory and wide-scale deployment.

By 1996, the Department had launched 83 field operational tests across the Nation. These tests are providing rich information on the benefits of individual ITS services and on the means to overcome institutional barriers to deployment. Nearly all of the tests have exceeded their initial schedule, largely because the Department was forging new ground in developing public-private partnerships and because the State and local agencies were forging new institutional arrangements. Both the technical tests and the issues involved with solving procurement and institutional problems have taught us much.

The ITS Priority Corridors program, created by ISTEA, has been extremely effective in teaching us about the institutional arrangements necessary to advance intermodal approaches to regional and multi-State transportation needs. In March 1993, DOT designated the four locations that met the ISTEA Section 6056(b) criteria as ITS Priority Corridors: the Northeast Corridor along Interstate 95, stretching through six States from Maryland to Connecticut; the Gary-Chicago-Milwaukee Corridor centered around the Chicago metropolitan area and stretching from Gary, Indiana, to Milwaukee, Wisconsin: the Houston, Texas metropolitan area; and the Southern California Corridor centered around Interstate 5 and Interstate 10 from Los Angeles to San Diego.

Deployment Support

State and local governments need assistance in overcoming the complex obstacles to adoption and deployment of advanced technologies. The ITS program has spent roughly 13 percent of its funding to facilitate understanding, acceptance, and deployment of ITS services. These programs include technical workshops, forums that bring together elected officials and transportation professionals, and training programs to build the essential professional capacity to support advanced transportation systems.

In particular, the Early Deployment Planning program has provided funding and technical assistance to local and regional agencies to develop plans on how ITS solutions can be applied to local problems. Ninety early deployment plans (EDPs) are serving as key mechanisms for incorporating ITS into the traditional transportation planning process. A survey of 13 areas found that at least 29 ITS projects valued at more than $210 million have been initiated directly because of the EDPs.

What Have We Accomplished?

The ITS program has made unprecedented progress in bringing a set of research concepts to the point of national deployment (for first-generation ITS services) and breakthrough development for in-vehicle safety and information systems. Eleven significant achievements are outlined on the following pages:

1. **Defined a vision for the ITS program and charted a course to achieve it.**

In 1992, the Department and ITS America published complementary ITS visions and strategic plans. In March 1995, they jointly published the National ITS Program Plan, developed cooperatively to guide the development and deployment of ITS services. The plan provided the foundation for DOT's efforts to develop "road maps," which began in mid-1995. These road maps mark milestones and critical paths for achieving key program objectives.

Both the strategic and program plans are "living" documents, which have been progressively refined through research and detailed subprogram strategic planning.

2. **Launched an aggressive research and technology program.**

The national ITS program has helped ITS evolve from a relatively visionary concept to a viable and attractive solution for transportation problems. To a large degree, general concerns about the technological limitations of ITS have either sharpened to specific questions or been resolved. Among its many achievements, the program has refined real-time adaptive traffic control; improved vehicle tracking technologies used in public transportation, emergency response, and commercial vehicle operations; developed guidelines to help ensure that traffic management systems and in-vehicle navigation displays are user-friendly and safe; and promoted architecture and standards to ensure that ITS services are compatible and interoperable. Perhaps most significantly, the program has achieved breakthroughs in showing the value and, in several cases, the technical feasibility of "smart vehicles" that can sense objects, avoid collisions, monitor driver alertness, and provide route guidance information. The Department is now

poised to launch a major series of operational tests and begin integrating these systems within a human-centered in-vehicle configuration.

3. Tested and proved the viability of numerous technologies and applications.

The Department's 83 operational tests, 28 of which are completed, are demonstrating the viability of first-generation ITS technologies and services. These tests have identified and resolved technical issues, created new models of institutional cooperation, and shown how myriad technologies can reduce congestion, improve emergency response time, increase transit system productivity and passenger convenience, and reduce the environmental impact of transportation. We are now seeing products and services refined by the operational test program-such as Boston SmarTraveler's real-time travel information service or Help, Inc.5 Pre-Pass electronic clearance system for trucks-become self-sufficient and competitive in the marketplace.

4. Developed a national architecture to support ITS services.

In June 1996, the United States became the first country to develop a National ITS Architecture, the result of an unprecedented effort to provide a flexible and expandable framework for the development and deployment of ITS. Instead of a single design, the architecture provides an inclusive setting within which different designs can be implemented, yet can operate compatibly. The architecture identifies how existing infrastructure can accommodate ITS additions and technological evolution. It also provides a framework for the development of national standards to ensure national interoperability of conforming products from competing vendors.

5. Launched development of standards for hardware and software compatibility.

Standards allow communications, surveillance, monitoring, and computer processing systems to "speak" to each other; provide design guidance to manufacturers; and reassure purchasers that their systems will not be incompatible with other elements in the intelligent transportation system. In 1996, the Department signed cooperative agreements with five standards develop ment organizations (SDOs) to accelerate the development and acceptance of standards in the five critical areas of in-vehicle and traveler information systems, *traffic* management and transportation planning systems, electronics and communications message sets and protocols, roadside infrastructure, and unique short-range communications strategies. Other standards have also been identified and are being pursued by national and international standards organizations. The adoption of the National Transportation Communications ITS Protocol (NTCIP), which facilitates wireline communications between traffic management centers and roadside equipment, and the "Smart Bus Bus" suite of standards, which allows integration of electronic functions on transit buses, are two of the program's early achievements.

6. Evaluated societal benefits of independent and integrated ITS.

The DOT report, Review of ITS Benefits: Emerging Successes, and other documents such as Benefits Assessment of Advanced *Public Transportation Systems* and *Assessment* of *Intelligent Transportation SystemslCommercial Vehicle Operations User Services: ITS/CVO Qualitative Benefit/Cost* Analysis have shown how ITS technologies can positively impact transportation efficiency, productivity, safety, and user satisfaction. Research on the public benefits of ITS establish a compelling national interest in launching the ITS infrastructure to enable not only the vision and mission of ISTEA, but also open up a whole new array of private sector goods and services in much the same way as the Internet did.

7. Identified and proposed solutions to remove nontechnical barriers to implementing and mainstreaming ITS.

The Department initiated a major investigation into the institutional and legal issues associated with intergovernmental cooperation, public-private partnership, intellectual property rights, procurement, privacy, user acceptance, staffing and education, socioeconomic issues, and environmental issues. The results are documented in the 1994 and 1996 congressionally mandated reports, *Nontechnical Constraints and Barriers to the Implementation of Intelligent Transportation Systems.*

8. Created new models of public-private partnerships.

Because successful development and deployment of ITS will rely on the efforts of both the public and private sectors, the Department has striven to involve the private sector in all facets of the program, from research to testing to deployment initiatives. For example, NHTSA has nine cooperative agreements with industry

to develop and test crash avoidance systems. As another example, the goals and activities of the AHS program are being realized through a cost-shared cooperative agreement with the National AHS Consor-tium (NAHSC), which consists of close to 100 public and private stakeholders, including automobile manufacturers, suppliers, universities, and State governments.

9. Set national goals to encourage widespread ITS deployment.

DOT has established a national goal to build the ITS infrastructure by 2005. Three "systerns" of infrastructure have been specifically defined to date: the Meuopolitan Intelligent Transportation Infrastructure, Commercial Vehicles Information Systems and Networks (CVISN), and the infrastructure associated with rural applications. This goal has helped to create a positive, "can-do" environment within Federal, State, and local governments, and has inspired confidence among private sector developers. The Department is specifically monitoring progress on achieving this goal in 75 metropolitan areas, and making plans to monitor deployment of CVISN.

What is Intelligent Transportation Infrastructure?

No single technology "fix" can address America's growing demand for and changing patterns of travel. To realize the promise of a truly national transportation system, ITS products and services must be seamlessly integrated and interoperable. Therefore, a critical goal of the ITS program is the development of an intelligent transportation infrastructure -a communications and information backbone-that supports and unites key ITS services.

This intelligent transportation infrastructure is not just a collection of components. It also allows these components to communicate with each other and to work together, much as the local- and wide-area networks used in most workplaces allow electronic file sharing, mail, and other information exchanges within a single building or between geographically dispersed sites, although individuals may have different brands of computers and software of varying capability. Workers increase their productivity and utility, and so does the workplace as a whole.

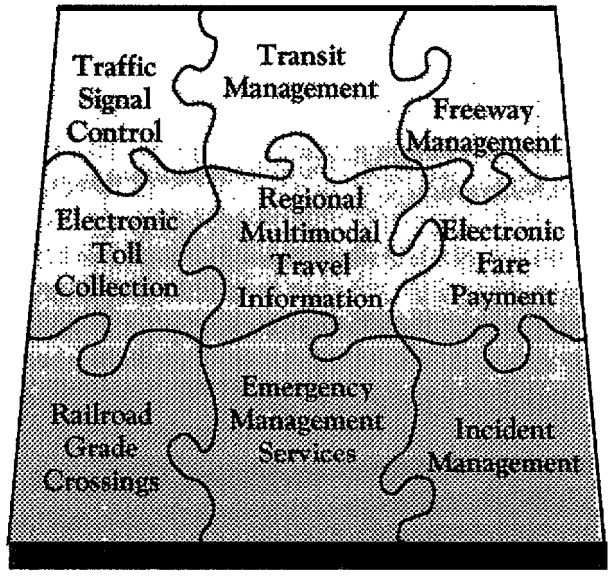
The needs of three specific types of users-metropolitan residents, commercial carriers, and rural residents-have emerged from the national ITS program's efforts:

> **The Metropolitan Intelligent Transportation Infrastructure** will integrate advanced traffic management, traveler information, and public transportation systems. In January 1996, Secretary Federico Pena announced Operation Timesaver, a national goal aimed at deploying ITS infrastructure in 75 of the Nation's largest meuopolitan areas within the next decade, with an eye toward cutting travel times in metropolitan areas by 15 percent.

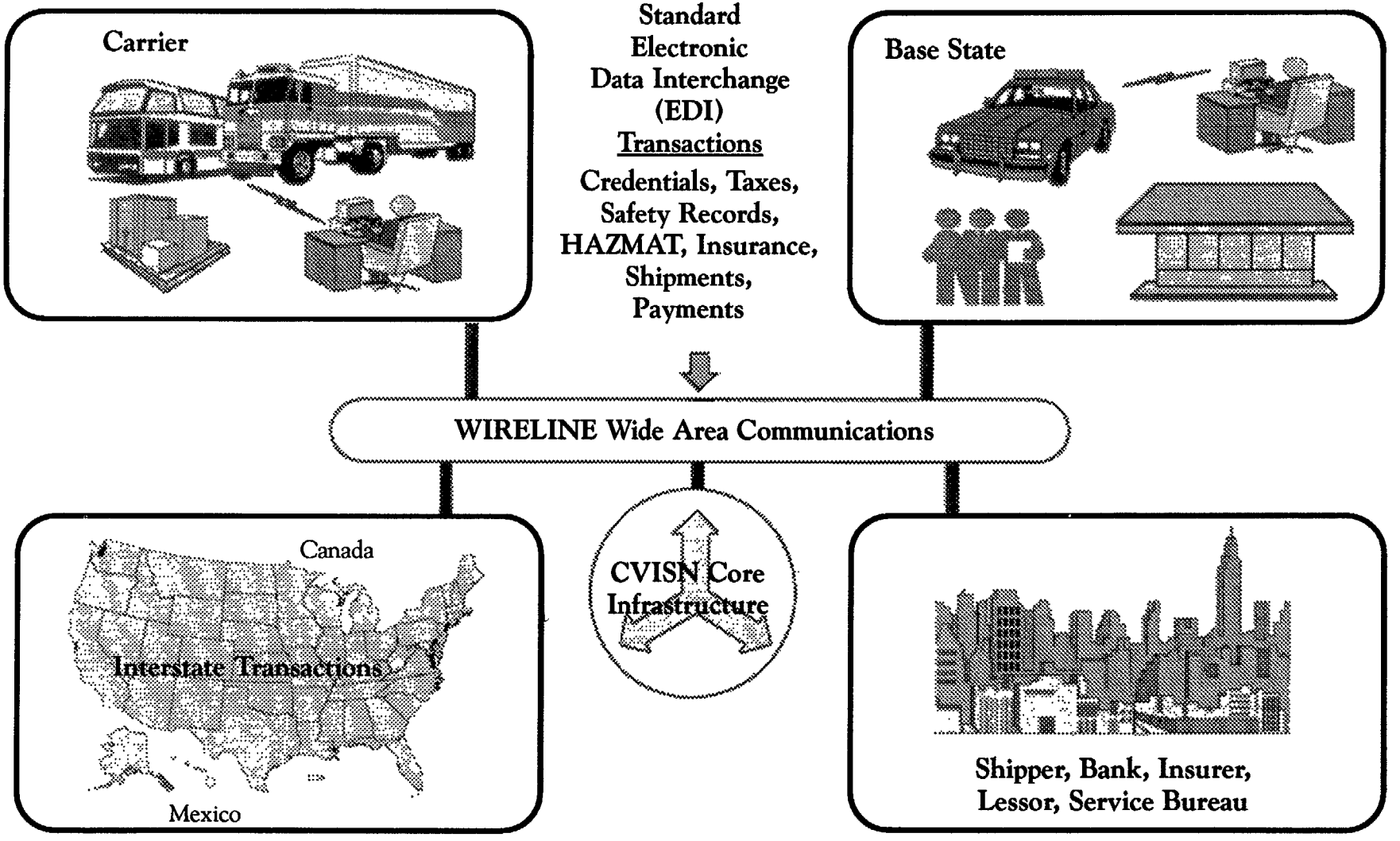
> **Commercial Vehicle Information Systems and Networks** (CVISN) will integrate ITS/CVO user services to achieve safe and efficient shipping operations and enable elecuonic business transactions. The Department's goal is to encourage the public and private sectors to build CVISN in all interested States by the year 2005.

> **The Rural Initiative** has identified seven clusters of technologies to upgrade transportation systems in 450 communities, on rural roads, and in the National Highway System as warranted, and link rural areas with meuopolitan and commercial operations.

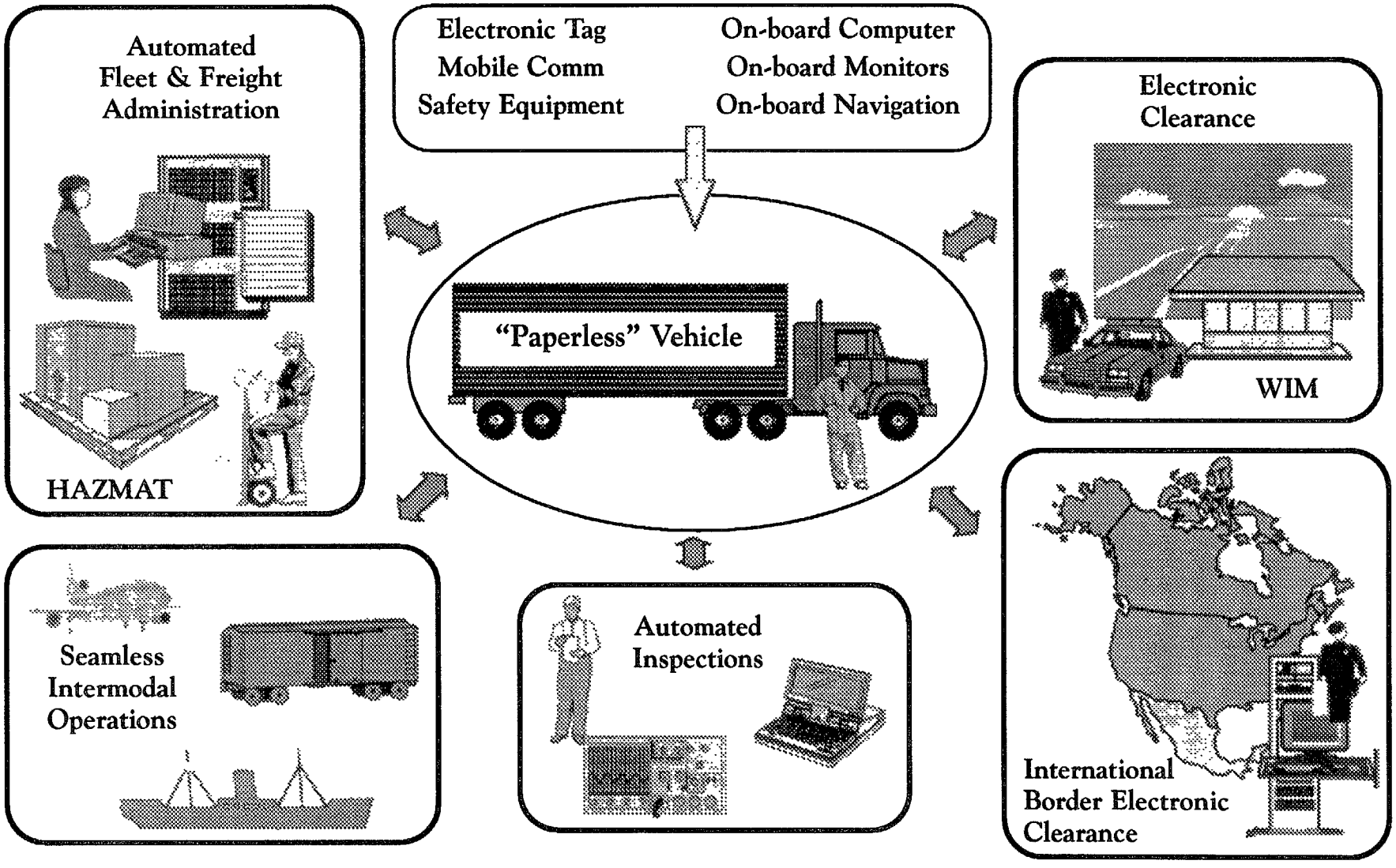
Metropolitan Intelligent Transportation Infrastructure



CVISN
Electronic Business Transactions



2. Vision:
Safe and Efficient Shipping Operations



10. Launched a model deployment initiative to demonstrate benefits of ITS infrastructure.

In 1996, the Department created the Model Deployment Initiative (MDI) to showcase the benefits and cost-effectiveness of ITS services integrated along the lines defined by the National ITS Architecture. By 1998, four sites-the New York City Tri-State area, Phoenix, Seattle, and San Antonio-will showcase the benefits of the metropolitan ITS infrastructure. In the same time frame, eight States will demonstrate CVISN: California, Colorado, Connecticut, Kentucky, Michigan, Minnesota, and, in a joint project, Oregon and Washington.

11. Developed plans to meet educational and human resource needs.

The transition to electronic management of surface transportation represents the same transition the Federal Aviation Administration underwent as it moved from the oversight of building airports with a mostly civil engineering staff toward better management of the air system, which required a very diverse set of technical skills. ITS uses information systems, communications, and navigation technologies that are unfamiliar to surface transportation professionals. ITS also emphasizes system management, operations, and performance measurement instead of construction and maintenance; and often requires unprecedented cooperation within and between the public and private sectors. The Department's national strategic plan and five-year Professional Capacity Building program address the need to retool the skills of the Nation's professionals in the transit, highway, and commercial vehicle operations fields.

What Have We Learned?

The program has demonstrated that ITS, even at this early stage, is technically viable, highly cost-effective, and increasingly accepted as an essential component of a modem surface transportation system. To realize the full long-term potential of ITS, however, an information and communications infrastructure is necessary to ensure that ITS services are integrated, intermodal, and interoperable. In addition, preliminary research on human-centered "smart vehicles" has demonstrated the potential for major breakthroughs in accident reduction and, when coupled with an intelligent highway (AHS), will achieve even greater breakthroughs in safety and capacity. The major findings of the national ITS program are documented in the 1996 report, Key Findings From the *Intelligent Transportation* Systems (ITS) Program: What Have We Learned!.

ITS delivers significant *public* benefits.

The Department's research and testing activities have demonstrated that ITS services can meet a wide range of community needs, enhancing capacity and improving efficiency, safety, and quality of life.

Efficiency and Enhanced Use of Existing Capacity. The Department estimates that deploying the intelligent transportation infrastructure in 50 of our largest metropolitan areas will reduce the need for new roads while saving taxpayers 35 percent of required investment in urban highways. Better management of transportation systems is central to achieving the efficiency envisioned by ISTEA. However, managing any part of the system-transit, highways, or streets-more efficiently is nearly impossible unless system managers have access to information, such as the location of a traffic incident. And information does little good if there is no means to respond and make adjustments to the system or to communicate with travelers. ITS field tests and deployments have shown that suategic application of information and control systems can significantly improve efficiency for system managers:

- ITS in&structure in 75 of the largest meuopolitan areas is estimated to have a benefit-cost ratio of 8.8 to 1.
- Freeway management systems can reduce accidents by 15 to 62 percent, while allowing the system to handle 8 to 22 percent more traffic at 16 to 62 percent greater speeds in comparison to congested conditions;
- Incident management programs have reduced incident-related congestion and delays by 50 to 60 percent;
- Electronic toll collection has increased throughput by 200 to 300 percent compared with traditional attended lanes: and
- Automated traffic signal systems have shown the capability to decrease travel times by 14 percent, reduce delay by 37 percent, and increase travel speeds by 22 percent;

Preventing Accidents and Saving Lives. Today, ITS technologies are making it easier for emergency response teams to locate incidents and reach victims quickly, dramatically improving the chances of survival. Freeway management systems, such as ramp meters that help smooth traffic flow, have reduced accidents by 15 to 20 percent. New information technologies for commercial vehicles are allowing more efficient and accurate safety inspections, increasing access to safety information for inspectors, and automating hazardous materials incident response systems. In the near future, better incident information and warning systems will reduce the high number of accidents at intersections and improve safety at highway-rail crossings. More startling, NHTSA estimates that 1.2 million crashes-l 7 percent of the total 6.4 million nationwide-could be prevented each year if all vehicles were equipped with three ITS crash avoidance countermeasures currently under development: rear-end crash warning systems, roadway departure warning systems, and lane change/merge crash avoidance systems. These systems would also save $26 billion annually in accident-related costs.

Reducing the Cost of Government Operations and Services. In the October 1995 report, *High-Tech Highways: Intelligent Transportation Systems and Policy,* the Congressional Budget Office states that "ITS research may enable highway and transit authorities to provide better service at lower cost, possibly reducing the need for public subsidies." In an environment of limited budgets and cuts in public sector subsidies, the components of ITS infrastructure can dramatically reduce the costs of transit management, toll collecting, and truck safety inspections:

> Advanced public transportation management systems in 265 actual or planned deployments have been estimated to save transit operators from $3.8 billion to $7.4 billion (1996 dollars) in operating costs, without diminishing quality of service;

> In Oklahoma, operating costs dropped from $176,000 to $16,000 per year per toll booth when booths were equipped with electronic debit systems, a cost reduction of 90 percent; and

> Commercial vehicle administrative programs have reduced compliance-related labor costs (licensing, permitting, registration, fuel-tax reporting, and credentialing) by 9 to 18 percent through the use of advanced information technologies.

Enhanced Quality of Life. Because ITS can enhance capacity using the existing physical infrastructure, it can lessen disruptions to wetlands, parks, open spaces, and neighborhoods caused by new construction. Also, ITS and its supporting infrastructure can increase mobility-giving people more information and greater control over their transportation choices. In greater Boston, for example, a majority of travelers change their routes, times of travel, or mode when they are given up-to-date information through advanced information services. National focus group research indicates high interest among all income groups in travel products that provide personal security and safety services, location assistance, advanced traffic notification, and alternative route advisories. Equally important as the Nation's baby boomers age, in-vehicle safety and information technology could enhance the capabilities of older drivers.

ITS infrastructure is ready for deployment.

ITS products and services are not technologies of the future. They are already being applied to solve problems for State and local transportation managers, enforcement officials, and other transportation service providers; improve the efficiency of commercial shippers and carriers; and provide travelers with better information to improve the quality and safety of their trips.

Public Sector Investment in ITS Is Growing

States and localities are investing in individual ITS technologies and components. Over $1 billion of Federal-aid funding was used for the deployment of core ITS services in fiscal year 1995, a 280 percent increase over fiscal year 1991. The use of Federal funds represents only a fraction of total State and local spending on ITS products and services. Further, our reviews of ITS deployment decision making revealed that when State and local officials have discretion over the use of funding to solve problems-air quality and congestion improvement problems in particular-ITS solutions rate very favorably.

[Although market and user acceptance of individual components of intelligent transportation infrastructure is growing, ITS deployment is occurring in a "stove-piped"-narrowly focused and disconnected-fashion. For the most part, transportation officials and managers are electronically reinforcing the fragmentation of today's transportation systems and infrastructure (which ISTEA sought to change), instead of using the technology as a bridge to a new era of intermodalism. Although individual ITS products and services produce specific benefits, integrated ITS infrastructure is expected to deliver multiple and synergistic benefits and provide more options for both system managers and travelers. The risk of continuing the current pattern of local deployment is electronic "hardening" of the fragmentation that will take decades and billions of dollars to overcome.

To close the gap between the great potential of integrated ITS solutions and the current state of frag mented ITS deployment, DOT has developed a four-pronged strategy for encouraging the public sector to build integrated ITS infrastructure.

Showcase the Benefits of ITS Infrastructure. The more exposure individuals have to useful products and services, the more likely they are to accept, purchase, and use them. The 1996 Model Deployment Initiative, which will demonsuate intelligent transportation infrastructure at approximately one dozen locations across the Nation, aims to raise the awareness of the benefits of integrated ITS services and encourage public sector officials to build supporting infrastructure.

Create Funding Incentives. ITS deployment is gaining momentum under existing surface transportation programs, but not consistently, optimally, or systematically. Temporary funding incentives are necessary to intervene in the current deployment process to foster integration and national interoperability. The power of small incentives was shown dramatically in the recent Model Deployment Initiative solicitation. The solicitation catalyzed institutional collaboration, even among sites that were not selected. Many of these sites are proceeding with their ITS deployment plans without direct DOT funding support.

Establish Standards. Public sector officials are hesitant to buy new ITS products that might become obsolete under future standards. Private firms are reluctant to invest in technology that may not meet future performance requirements. However, the relationship between standards and ITS infrastructure deployment is like the classic chicken and the egg: we will have difficulty integrating ITS without standards, yet setting standards will be difficult without strong demand for integrated ITS services. Therefore, the establishment of standards go hand in hand with deployment incentives as priorities in the Department's ITS program, and must be supported by the reauthorization of ISTEA.

Build Professional Capacity. Just as the Interstate construction program required new skills in roadbuilding and civil engineering, ITS requires skills in systems integration, electronics, and communications. Because professionals with these skills currently do not exist in sufficient numbers to support the effective delivery of ITS, carrying out the Department's five-year Professional Capacity Building plan is crucial to establishing the infrastructure to enable the ISTEA vision.

We must invest in the next-generation of ITS--particularly "smart vehicles."

The long-range potential of ITS cannot be fulfilled without "*smart* vehicles"-automobiles, buses, and commercial fleets-that can communicate with an intelligent transportation infrastructure to deliver information and options to drivers and passengers.

Research to develop and enhance such vehicle technologies must be carried out in collaboration with the industry that will potentially manufacture it. The risk of not making this investment is threefold: (1) the car of the future will largely be a "mobile computer." The economic block (Europe, U.S., or Japan) that develops the operating systems of this mobile computer will control the industry for a decade or longer; (2) without accelerated developmental research, current evidence suggests that these products will be very late (perhaps, decades) in arriving on the market, if they ever do. This potentially represents an unnecessary loss of millions of lives and billions in accident-related costs; and (3) individually developed systems without proper human-centered integration could actually degrade safety.

Many of the fruits borne by today's ITS deploy ments are being harvested from research and development initiated in the 1970s. Continued research and development is needed to provide the technological foundation for the solutions to tomorrow's problems.

What's Next? A Reauthorization Agenda for ITS

ISTEA launched a national ITS program that has amassed a formidable record of achievement. ISTEA II now has the opportunity to realize the benefits of that research and extend the horizon of accomplishment. Although the Department envisions a reduced Federal role, virtually all constituents agree that it must still provide critical research and technical assistance to State and local agencies particularly in the area of ITS. A principal goal of the next phase of the ITS program is to launch the deployment of integrated ITS infrastructure, develop the standards and the professional capacity to sustain it, and to extend our research horizon-particularly in the area of the integrated safety and navigational features of the intelligent vehicle.

Research and Technology

Continued funding is required to maintain the momentum of the ITS program's near- and long-term research and technology agenda. As provided by the initial authorization, the Department would continue to pursue both high-priority and high-risk initiatives, such ascollision avoidance systems, automated highway systems, advanced rural transportation concepts, and the next generation of advanced travel management and commercial vehicle operations systems. The research agenda would also support development of standards and the execution of me five-year Professional Capacity Building program, as well as field operational tests and evaluations.

Incentives To Accelerate ITS Deployment

Based on numerous focus groups and "listening sessions," two options have emerged for accelerating the deployment of ITS infrastructure. One option would provide small incentive awards to metropolitan areas, primarily to support the cost of systems integration-after the demonstration of institutional willingness to adopt and finance an integrated system. A second option would create a more traditional ITS deployment program that directly apportions ITS deployment funds to State and local agencies for ITS deployment. These funds would support both hardware procurement and systems integration. Funding eligibility under either option would be contingent on conformance with the National ITS Architecture, and supporting standards and protocols.

Mainstream Deployment Provisions

Existing Federal highway, transit, and motor carrier investment program policies and regulations have been refined over many decades, but without improved system management or ITS in mind. The successor to ISTEA must make explicit the eligibility of ITS deploy ment for mainstream Federal surface transportation funding. It should also pave the way for expansion of the capital planning process to include operations planning as well as ITS operations and maintenance. ISTEA II should also reconcile disparities between the highway and transit programs regarding the eligibility of ITS operating costs. For example, the National Highway System Designation Act allowed most highway funds to be used for ITS operations, yet corresponding provisions are lacking in the transit programs. In addition, the next surface transportation authorization must sanction innovative procurement and financing approaches, including public-private parmerships.

Conclusion

"This telephone has too many shortcomings to be seriously considered as a means of communications. The device is inherently of no value to us."

Western Union internal memo, 1876

Forty years ago, the Federal government conceived a plan to build the Interstate highway system, among the Nation's most ambitious public works projects. As in 1956, DOT is yet again serving as an agent to transform this Nation's surface transportation system-this time with the intelligent transportation infrastructure, which will provide the foundation for the management of the many individual systems as one seamless system. DOT does not propose to do this alone, but instead to encourage public sector agencies, with appropriate private sector support, to build this new infrastructure for the twenty-first century: one that applies information technologies to meet local needs, within a framework that enables a national, interoperable system-a system that will open up business opportunities much as the Interstate highway system did four decades ago.

A historic opportunity is at hand for Congress to dramatically improve the future of surface transportation. Although the full potential of the ITS program has yet to be revealed, enough has been learned in the past five years to verify the wisdom of forging ahead, nurturing the national ITS program and allowing it to fulfill ISTEA's promise of a safer, more efficient, and less costly intermodal transportation system.